Technology Corner

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GEOFOAM - Innovative Backfill to Minimize Settlement

For more information about Geofoam, or other foundation treatments on the I-15 reconstruction project, please contact:

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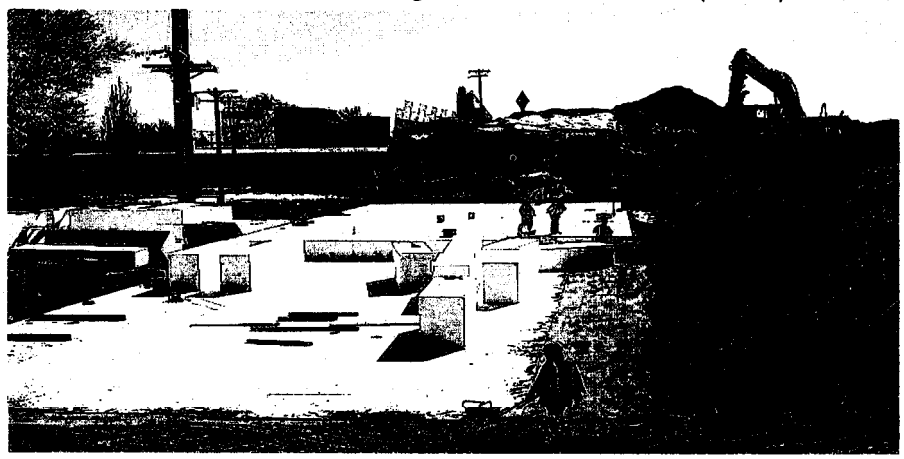
The Utah Department of Transportation, in conjunction with Wasatch Constructors, is reconstructing portions of the I-15 embankment with "Geofoam™." I-15 is approximately a $1.5 billion project reconstructing 17 miles of urban interstate. Geofoam blocks are made of expanded polystrene plastic, which looks similar to Styrofoam and is manufactured locally by Advanced Foam Plastics, Inc. in Murray, Utah . Because of its extremely low unit weight (one to two pounds per cubic foot), Geofoam is being used instead of conventional backfill to minimize settlement impacts to buried utilities and to improve stability of new embankment placed over weak foundation soils. Geofom has been applied by other state DOT's in New York, Indiana, Hawaii, Colorado, and California.

The primary use of Geofoam by the I-15 team is to-minimize settlement impacts to buried utilities lines that cross under mechanically stabilized earth (MSE) walls. Existing utility lines often transverse underneath areas where new embankments or ramps are being constructed (Figure 1). These utilities must remain in-service during construction. However, in areas where conventional borrow is used for backfill, expected construction settlement of the clayey foundation soils is about 0.5 to 1 meter. This large amount of settlement exceeds almost all strain tolerances for buried utilities; thus, these utilities would normally require a costly replacement or relocation.



(Figure 1)

However, because of the low unit weight of Geofoam, it is being placed as a "light-weight fill" over select utility corridors to protect these corridors from large differential settlement. In the application areas, the expected settlement for Geofoam fill is small (i.e., less than a few centimeters) due to small loads imposed by the Geofoam. The placement of Geofoam enables buried utilities to remain in-situ,. without expensive interruption, replacement, or relocation.

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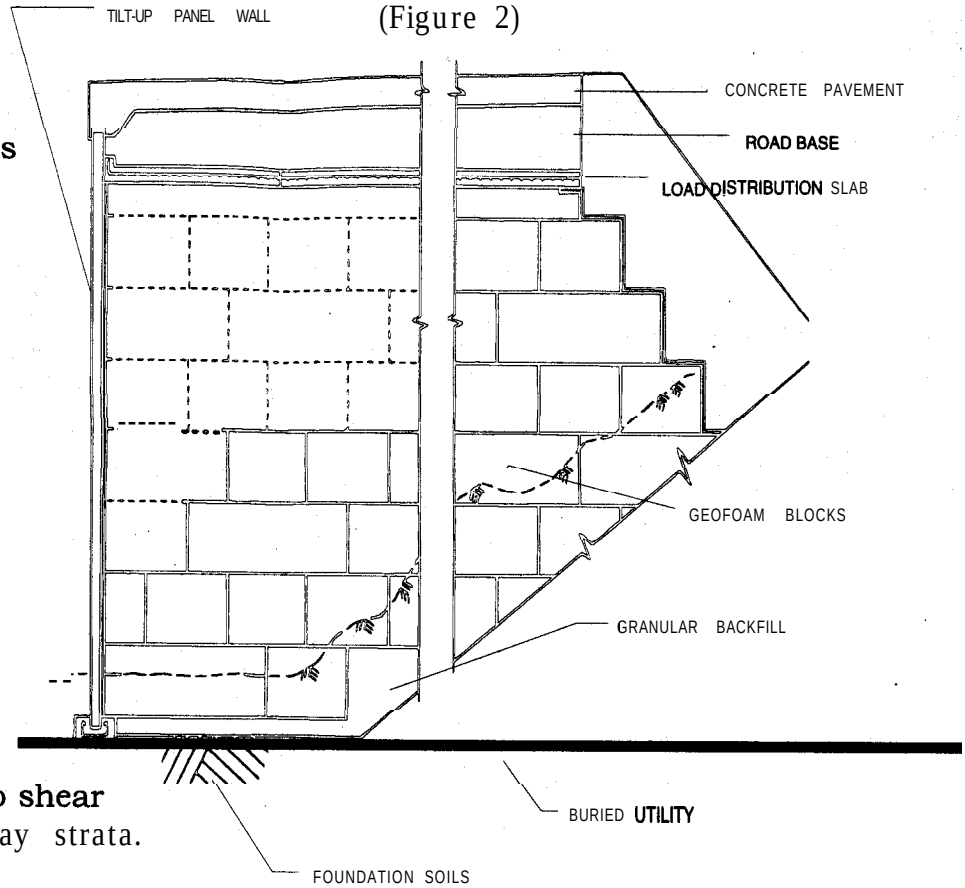
Another use of Geofoam on the the I- 15 project is improving the global slope stability of MSE walls. In some areas, relatively high MSE walls (ranging from about 10 to 14 meters) must be rapidly constructed on relatively weak foundation clay.

Slope stability calculations suggest that, if the strength of the foundation soil is not improved, some walls could experience slope instability, due to shear failure in underlying clay strata.

(Figure 2)



To address potential stability issues, typical methods used by Wasatch Constructors have included:

- Placement of PV (i.e., wick) drains to increase consolidation rate and expedite the subsequent strength gain in critical clay strata.
- Placement of geotextile near the base of the embankment to improve shear "resistance.
- Multi-staged embankment construction.
- In extreme cases, soil improvement via lime cement or stone columns near the toe of the embankment.

However, these more conventional approaches have their attendant costs and require a good deal of time to construct. Instead, because of schedule and/or geometry constraints, Wasatch Constructors has elected to use Geofoam backfill behind a handful of MSE walls. These "Geofoam walls" are essentially Geofoam blocks, with a vertical face that is later covered by a tilt-up panel facia wall (Figure 2). Because of the light weight nature of the Geofoam backfill, these walls can be constructed in a matter of a few weeks, without any significant stability issues or the attendant foundation treatments.

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